District Maintenance

TEXAS Highways

December, 1956

62

Do You Know Texas ?

One of the oddities of Texas tree growth is the southern pine section centered in eastern Bastrop County and lying isolated approximately 100 miles west of the main pine belt. Known as the "Lost Pines," most of this area is included in Bastrop State Park, one mile east of the town of Bastrop on U.S. 290.

Timber from the pine forest was used in many of the homes of the first settlers of Texas, and was transported by wagon as far as Austin, San Antonio, and parts of Mexico. Controlled logging is still carried on, but for state parks use only. Pine seedlings from this pine belt have proved to be more drouth resistant than their eastern Texas cousins.

This pineland area was originally bequeathed to the city of Bastrop by the man who settled there in 1837, Holland-born Baron de Bastrop. One hundred years later it was designated as a state park, and work of the Civilian Conservation Corps began to make this a popular area for tourists. There are now eleven cabins, made of stone and clapboard, built on the west side of a small lake. Each cabin has a fireplace, cooking facilities, and two or more bedrooms.

In addition to the cabin and the camping areas, Bastrop State Park also has a golf course, swimming pool, playground equipment, and a dance terrace. A twelve-mile scenic park drive connects Bastrop State Park with companion Buescher State Park near Smithville.

About the Cover . . .

Apparently everyone has heard of Padre Island with its mild winter climate, even that bewhiskered old gentleman whom we ordinarily associate with the snow and ice of the North Pole. (That's the one on the left.) An alert photographer caught him enjoying the sun and surf at Isla Blanca Park on the southern end of Padre Island, just like any other tourist. In case you don't recognize him in bathing trunks, the monogram SC should give you a clue to his identity. That is a Padre-type Christmas tree on the right, appropriately decorated with sea shells. Even those skeptics who insist that there is no Santa Claus agree that this is a clever, and certainly unusual, display, especially when a pretty girl in a bathing suit is added.

Vol. IV

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TEXAS Highways

The purpose of this publication, "Texas Highways," is to furnish a medium for presenting practical ideas and information. Employees are invited and urged to submit suggestions and relate experiences which would benefit or be of interest to Highway employees. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions.

Photographic services are available and other assistance may be obtained, if desired, in preparing material for submission. All material and comments should be directed to the Information and Statistics Division, Austin 14, Texas.

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Information and Statistics Division

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CANDID CAMERA -ATOMIC MODEL-

A. H. Pollard, Supervising Field Engineer
Materials and Tests Division

One of the latest developments in the Materials and Tests Division is a means of detecting flaws in steel welds, both in the fabricating shop and during erection of beam and girder bridges. This device is a gamma-ray projector, sometimes referred to as an isotope camera.

The principle involved is similar to making an X-ray picture, except that gamma rays from a radioisotope* are used instead of an X-ray tube. By placing an unexposed film on the opposite side of a steel weld and directing the gamma rays through the steel, a shadowgraph is made on the film. By proper interpretation of the film the location, size, and nature of defects—or absence thereof—may be readily ascertained in much the manner that the doctor locates the safety pin in little Jimmy's esophagus.

The projector design has resulted from research and investigation carried out by the Texas Transportation Institute at Texas A & M College (Project RP-5). Jack K. Gilbert was Project Supervisor of this work under the direction of Fred J. Benson.

After it was decided that gamma rays appeared to offer the most versatile and economical means of revealing the soundness of metal welds, the Materials and Tests Division was commissioned to develop a suitable projector, procedure for its use, and train personnel to use this inspection control.

Using average conditions and films, the projector can provide suitable radiographs of steel from three-eighths inch to four inches in thickness. Thinner and thicker sections may be radiographed by use of other isotopes

*A radioisotope is an unstable form of an element or compound that emits radioactivity in disintegrating atomically to a stable form.

and special techniques.

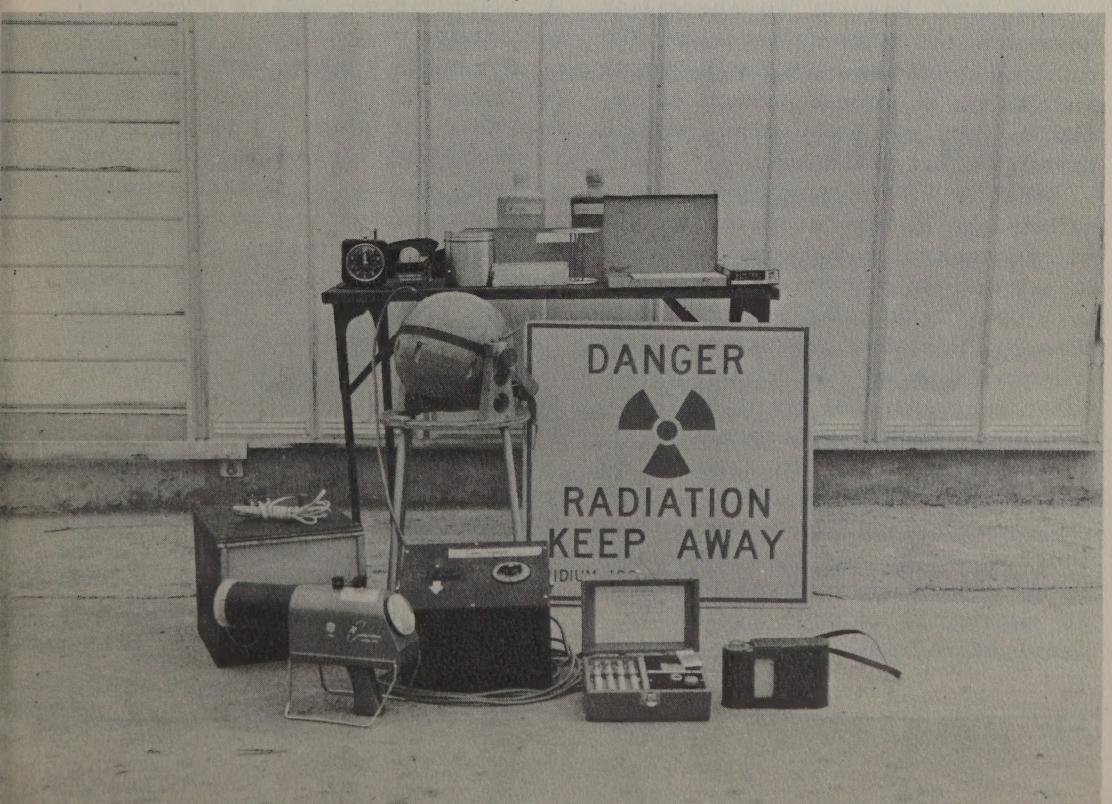
Basically, the projector is a lead ball about five and one-half inches in diameter, so arranged that a segment of the sphere can rotate. The energy source, which is Iridium 192, is attached to the segment so that the normal position when not in use is at the center of the ball, thus affording the maximum shielding effect of the lead. When the projector is used to expose a film, the segment is rotated to bring the energy source to the surface with a minimum of shielding in the beam, but still giving a maximum of shielding to the rear of the projector, where the operator should be.

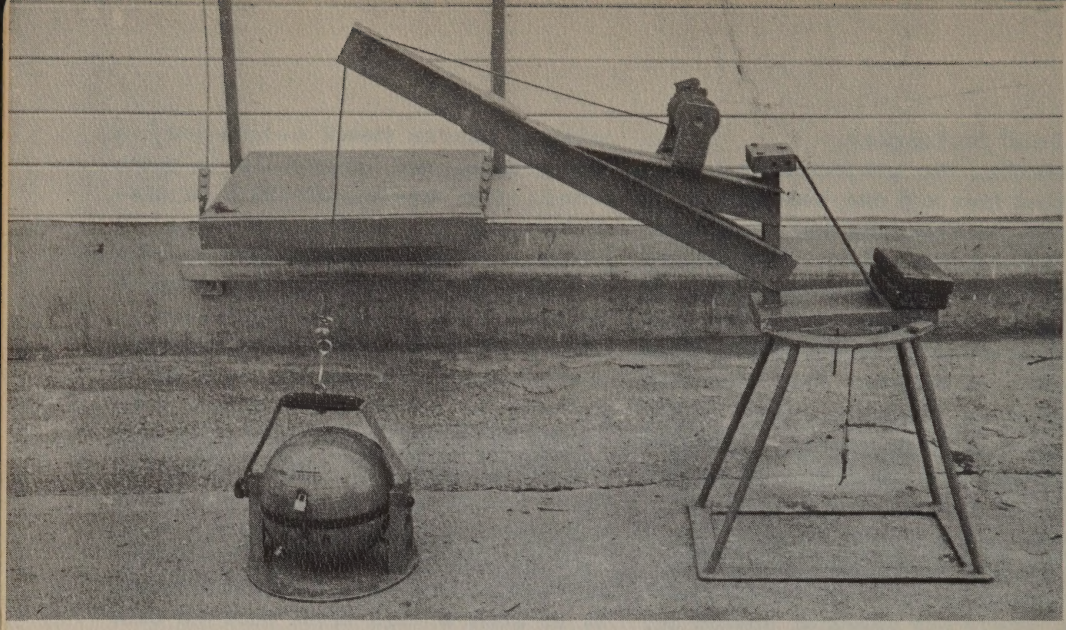
Iridium itself is a very dense metal having a weight about twice that of lead, and its atomic weight is 193.10. When iridium is exposed to the proper type of radiation in an atomic pile, its atomic weight can be changed to 192, in which state it is unstable and radioactive. While the iridium source itself weighs only a few grams, and physically is quite small, just one-eighth inch in diameter and one-eighth inch long, it packs a terrific wallop, energywise,

Radioactive material is measured by the curie, which is expressed as that quantity of radioactive material that disintegrates at the rate of 37 billions of atoms per second. We expect to acquire about 20 to 25 curies at a time from the Atomic Energy Commission. A special license is necessary to possess any amount.

The energy emitted by the small iridium pellet, when fully irradiated, is of such a high level that the safe distance in front of the projector when it is in use is about 150 feet. While some isotopes have a life of billions of years and others only a few millionths of a second, iridium is relatively short-lived. Since the rate of decay is exponential the life is described by half-life. In other

The radiography equipment now used consists of film developing equipment on the table, a film viewer, projector and remote control box, and radiation detection equipment.





This is the projector with bracket hoist and ladder in the background.

words, Iridium 192 has a half-life of about 74 days, that is, the strength of the source becomes reduced one-half each period of 74 days. It never loses all of its radioactivity, but a twenty curie source is only ten curies in 74 days, and so on.

The AEC has set an absorption tolerance for human tissue of 300 milliroentgens per week for the whole body as the maximum amount of radiation which can be absorbed without harmful effect to the body.

What is a milliroentgen? Just to satisfy you in this respect, so you will perhaps not go away unenlightened, it is defined thusly — A roentgen is a quantity of radiation which will, through ionization, produce one electrostatic unit of electricity in one cubic centimeter of air at 0° Centigrade at standard atmospheric pressure. It is a unit to express the amount of radiation absorbed—a very large unit, being about the amount which would be received in one hour from a point about three feet from an unshielded capsule containing a gram of radium. A millicurie is 1/1000 of a curie and a milliroentgen is 1/1000 of a roentgen.

The lead ball encompassing the energy source is surrounded by a fiber glass shell. Between the shell and the ball are some small batteries, switches, and appurtenant controls. A flashing neon light is mounted on the outside of the shell.

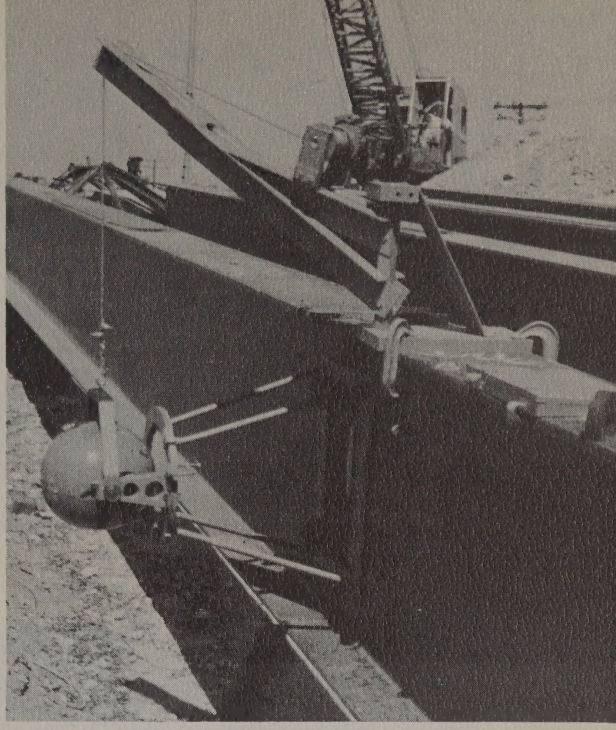
A remote control box with timer is connected to the projector so the operator can place himself in a safe position. By means of the remote controls he can open the projector and set the timer to give desired film exposure, after which the control automatically closes the projector so the operator can approach and handle it with no danger from radiation. The neon light flashes when the iridium is not rotated to a safe position.

The projector weighs about 45 pounds and the control box about 10 pounds. The weight of the projector is the important thing, since it is the part of the equipment which needs to be carried into places restricted as to ease of approach.

Several pieces of necessary equipment have been designed and made by personnel from the Bridge and Equipment Divisions as well as from the Materials and Tests Division. One very useful piece is the lightweight bracket-type hoist used to lift and support the projector.

Films are developed on the job at present with daylight developing tanks and changing bag, but a mobile laboratory providing proper temperature controls and darkroom facilities to permit rapid work is being designed.

While this atomic camera is being used for investigation of steel welds at the present time, it can look through most anything. If an engineer wishes to examine the inside structure of a metal casting or a concrete wall it is available and ready. In fact, there is no way to cut it off. Until eternity it will still be emitting those difficult to define, and difficult to pronounce milliroentgens.



The projector is being used for web splice weld radiography on the Bell County Overpass on State Highway 317.

NOTE BY D-9: Details are currently being worked out for using this equipment for the inspection of structural welds in the fabrication shops and in the field. The report by Mr. Fincher of District 9 relates experiences in the field inspection of welds using the isotope camera.

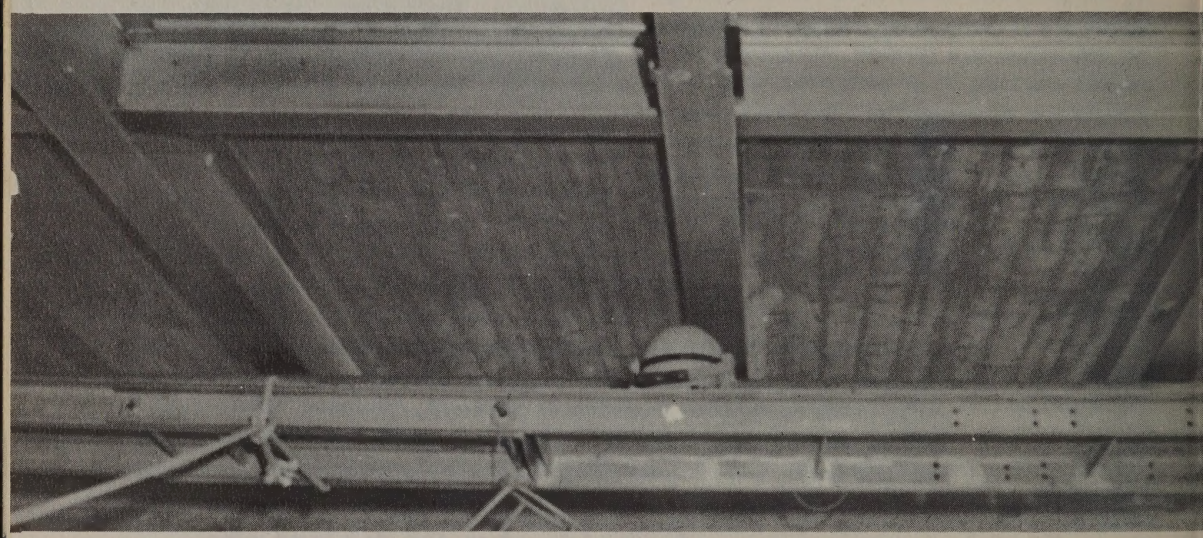
Field Inspection of Welds by Radiography

James B. Fincher, Assistant Expressway Engineer
District 9

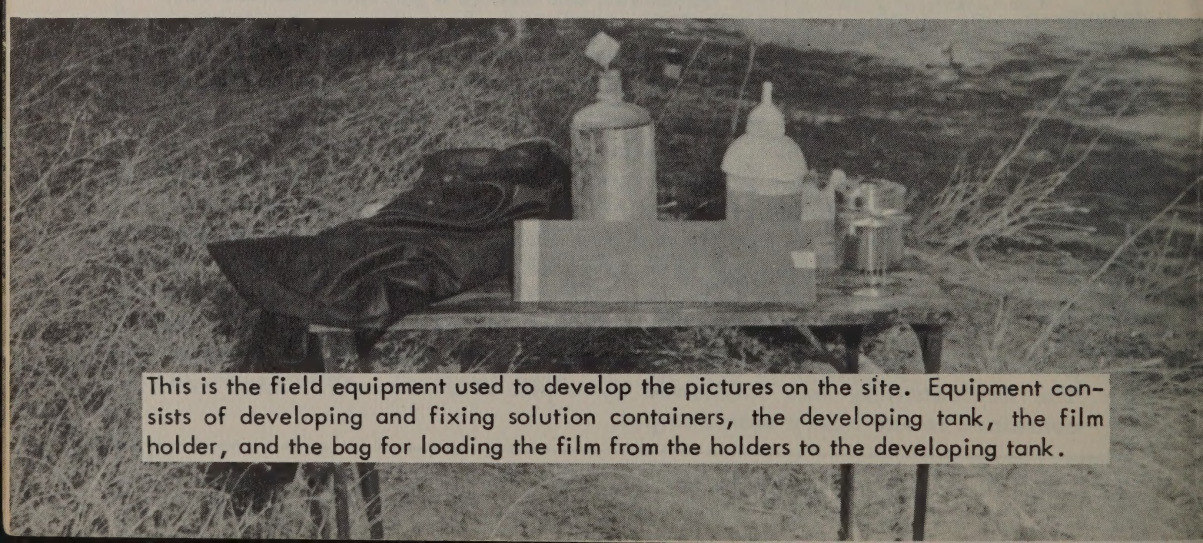
On October 2 the writer observed the use of a portable device for photographing the welded splices on a continuous I-beam bridge. The bridge was located at Cow Creek crossing with F. M. 183 in Coryell County. This structure was completed several years ago but since it was among the first welded I-beam bridges in this District, Resident Engineer Paul Hensler decided to have a look at the welds.

The photographing equipment consisted of a heavy shielded pot containing the radioactive material, a timing device, and the film holder. The timing device opened and closed the openings on the pot so that the operators did not have to be near it when the gamma rays were being emitted. The operators had several instruments to detect and measure the radioactivity. Devices to record the amount of gamma rays absorbed in a given period were worn on the clothes. The radioactivity was furnished by a pill of Iridium 192 which was contained in the heavy shielded pot.

Martin Heleman of D-5 and Jack Gilbert of D-9, the operators, are as far removed as possible during the actual time of exposure.



The exposure is being made for the picture of the bottom flanges. Note the negative holders lying on top of the flange, held by horseshoe magnets.



This is the field equipment used to develop the pictures on the site. Equipment consists of developing and fixing solution containers, the developing tank, the film holder, and the bag for loading the film from the holders to the developing tank.

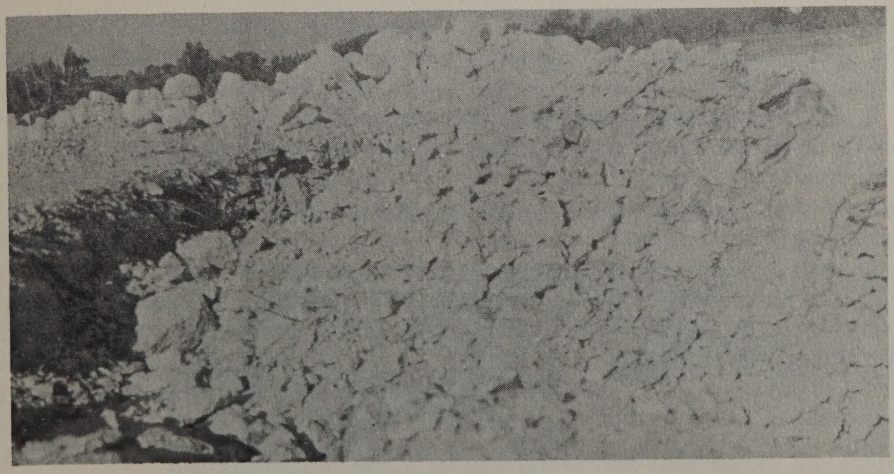
ROAD PROCESSING EDWARDS LIMESTONE

Paul T. Hensler, Senior Resident Engineer
District 9

In Coryell and adjoining counties in the western part of District 9 material selected for the item of foundation course usually consists of gravel, caliche, or a nodular limestone which in each case is readily adaptable for road processing. Occasionally however, these types of material are not available near the project and to use them would mean an excessive amount of overhaul. Such was the case on Farm Highway 929 between Coryell City and Osage in the northeastern section of Coryell County, consequently a material source was located in the Edwards Limestone formation.

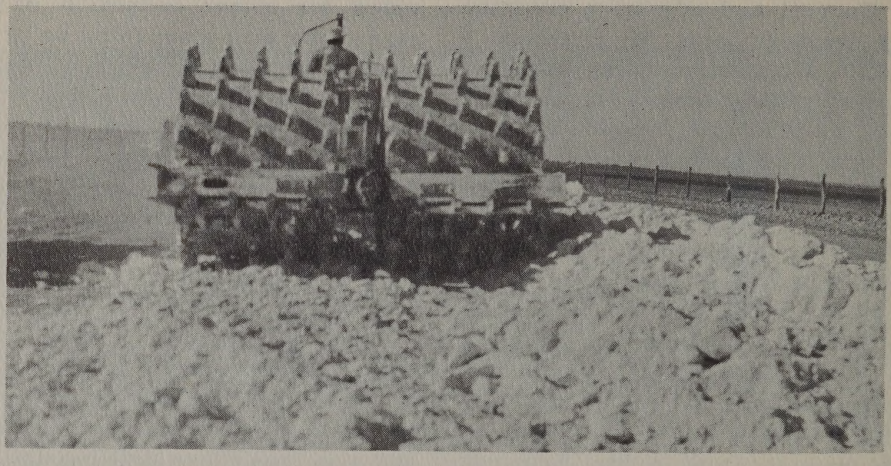
Our item of foundation course provides for either reduction of oversize at the pit by crushing or processing the pit run material after delivery on the roadway. Selection of the method to be used is left to the option of the contractor. Normally, Edwards Limestone material would be processed at the pit by crushing, however, due to the small amount of material involved the contractor was unable to secure a crushing and screening plant and road processing was decided upon.

Edwards Limestone in its original state is a solid mass of limestone and requires close drilling and heavy blasting to prevent an excess of boulders. A portion of the pit face



A solid mass originally, this Edwards Limestone requires close drilling and heavy blasting.

The dozer spreads the material for the roller to break it up.



The sheepsfoot roller breaks down the oversize material which has been dumped onto the roadway.

This is the texture of the processed material in the final stages of laying in.

Pictured here is the completed base just prior to final finishing.

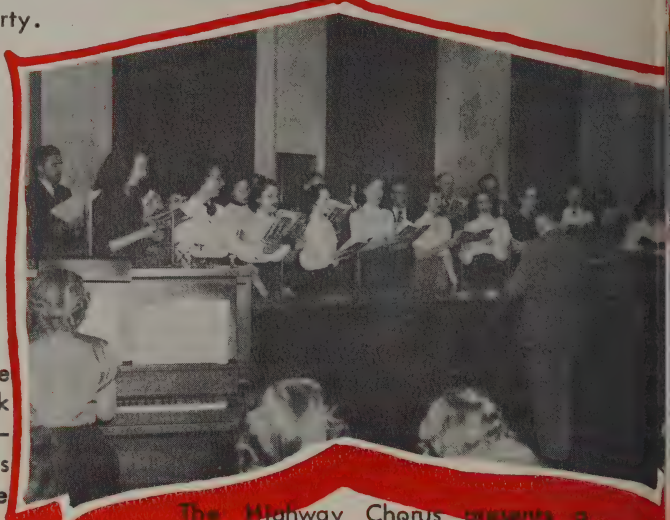
and loosened material is pictured.

After the material was dumped on the roadway a D-7 tractor and dozer pulling a heavy tamping roller was used to break out and spread a part of the material on the subgrade. The initial processing was done by the dozer and tamping roller, and use of this unit was continued until the oversize material had been reduced to a size small enough to permit the use of a flat-wheel roller. The two roller units working together further reduced the oversize to specifications. During this stage of processing two laborers were also employed to assist in breaking the larger rock by sledging. Pictures 2 and 3 reflect the coarseness of the material and the processing method just described. After each layer was processed it was placed into a windrow on each shoulder of the road and the process was repeated until all material had been reduced in size to meet our specifications. Approximately 700 to 1000 cubic yards of the material were delivered on the roadway and processed in this manner each day.

After processing, the base course was laid in using the usual construction methods with the exception that the sheepsfoot roller was used in addition to pneumatic and flatwheel rolling.

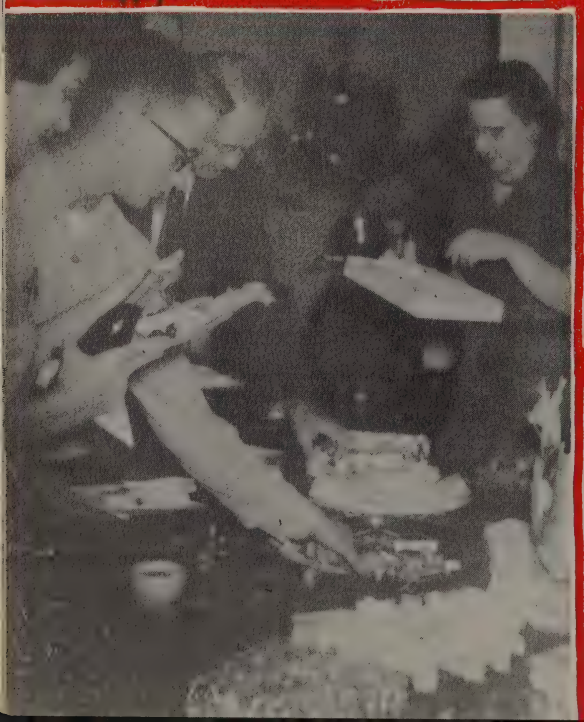
Christmas Season

Linda Rose Parmer holds her gift received at the District 20 party.



The Highway Chorus presents a Christmas program each year in the main office in Austin.

At the District 9 Headquarters party the food was so good everyone went back for more. Sue Crow, Gerald Sumerford, and T. C. Collier reach as Elizabeth Morrow replenishes the supply.



Equipment and Procurement Division has a party each year for underprivileged children.

over the State...

Dennis Gilley and John Self drink coffee at the Christmas party at the Construction Warehouse in Voth, District 20.

Mrs. Harlan Furry led group singing at the District 20 Shop party.

Pat Bloomfield and Martha Schliska gather bougainvillaea for the Christmas party in Pharr, where a southern Christmas is in order.

District Engineer W. E. Simmons delivers the welcome address as Santa Claus, Sidney Smith, watches in Beaumont.

SELF-PROPELLED

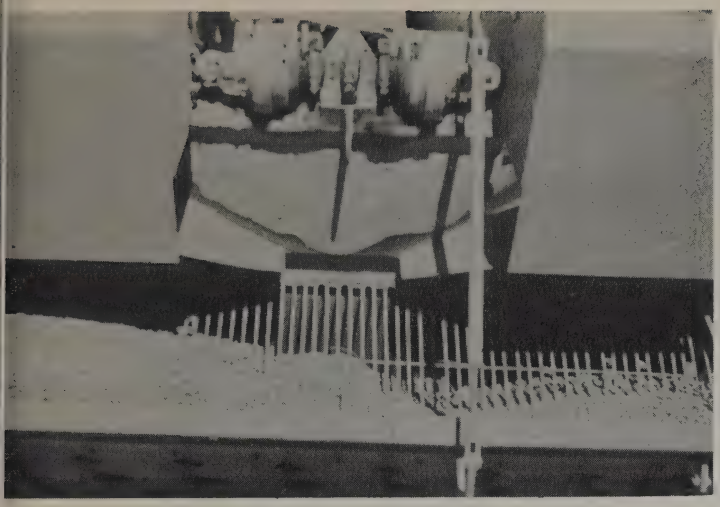
Power Spreader

R. L. Faltinson, District Engineer
District 6

The Angelo Construction Company was the low bidder on 217.279 miles of seal coat work contracted in District 6 this year. This contracting firm placed all of the aggregate on our seal coat work with a self-propelled power spreader. This new development in road building equipment has many outstanding features.

The power spreader has five forward speeds and five reverse speeds. It was found that the best operating speed for this work was in third gear. It was also discovered that operating in a higher gear it had a tendency to bounce, but this could possibly be corrected by tire pressure adjustments. Equipped with power steering for ease of operation, the machine has two operators, one who steers the machine and adjusts the flow of aggregate on the asphalt, the other who

Aggregate in rear hopper, delivered by conveyor belt to front bin.



Grill over front bin retains oversize material or foreign matter.

Screen allows deposit of coarse aggregate ahead of fine aggregate on asphalt for dense, uniform surface.

controls the conveyor belts and operates the hitch that hooks on to the aggregate haul trucks. Aggregate is dumped from the haul trucks into the rear hopper where it is carried on conveyor belts to the front bin. The aggregate spills from the conveyor belts onto a grill over the front bin which retains all oversize aggregate or trash that might accidentally be picked up in loading the aggregate from the stockpiles. As the material leaves the front bin it falls over a screen which is set at about a 75- or 80-degree angle. This places all the coarse aggregate on the asphalt before the small aggregate falls through the screen on the coarse aggregate, thus filling the voids and providing a dense, uniform surface. The machine gives a uniform spread of the desired distribution of aggregate and eliminates the

The power spreader in operation.

Placing the second half of seal coat.

Uniform aggregate distribution applied by power spreader.

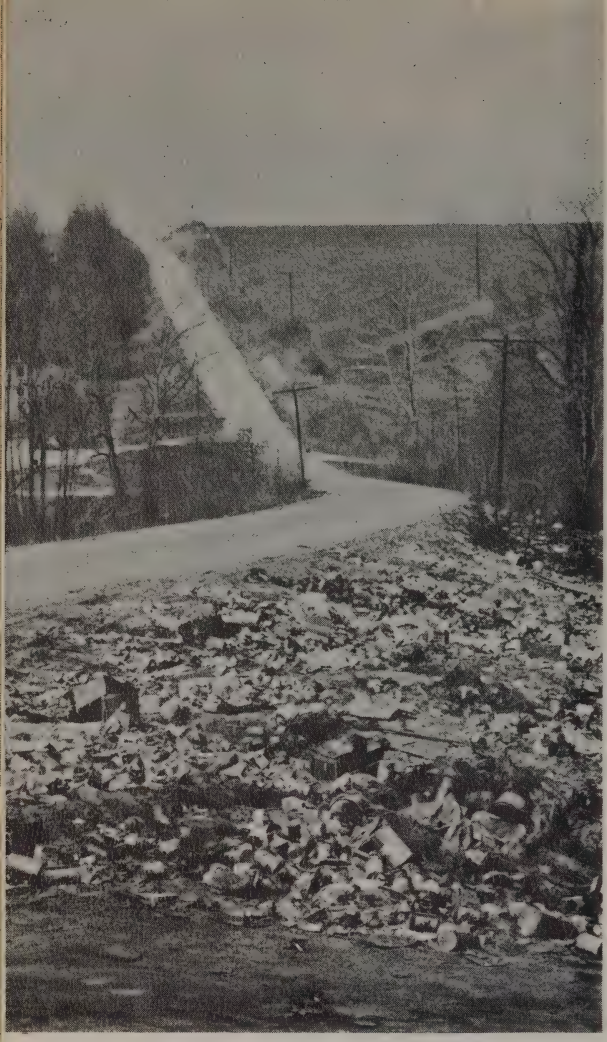
human error generally involved on the old conventional type spreader box.

The power spreader can be adjusted for any desired distribution of aggregate. It was planned that the aggregate be placed at the rate of one cubic yard per 105 square yards, and the actual distribution from quantities placed on the road averaged one cubic yard per 103 square yards. This indicates the uniformity of aggregate distribution.

This machine will spread aggregate to a width of thirteen feet and by easy adjustment can be reduced to a lesser width. The contractor, working an average of nine hours a day, was able to place from nine to ten miles of seal coat. It was found that this self-propelled spreader could easily keep up with the placement of asphalt. Usually the volume of work was limited to the amount of asphalt placed and the loading and hauling equipment available to load and supply aggregate to the power spreader.

Only a limited amount of brooming and blading was required on this work due to the uniform distribution of aggregate. Generally this was confined to the area where the aggregate overlapped as a result of placing the seal coat in half widths.

This type of machine is far superior to any previous method of aggregate application with which we have had experience. It requires fewer laborers, insofar as the contractor is concerned, than the old conventional methods. In the judgment of the personnel engaged in this work, it was found to be a much safer machine as far as operators are concerned and also to the traveling public.



Let's Eliminate the Trashway

While the driving public are singing the praises of the expressway, the freeway, and the super highway, they are happily throwing paper, bottles beer cans, and banana peels out the window, giving us the "trashway." And there are no praises to be sung for the trashway. The litterbug habit is a deplorable one, and those who regard all outdoors as a convenient dumping ground should rightfully wind up with a nondisposable fine.

Carelessness of motorists in dumping litter, fruit rinds, half eaten sandwiches, and other odds and ends along the highway is a major problem, and for a number of reasons, something should be done about it. One reason is cost. Another is plain old look-ability, and still another is safety.

Texas' tourist crop—larger than most other states—sees and remembers the appearance of roadsides in the Lone Star state, and they tell. No matter how blue the bluebonnets, how stately the Spanish daggers, and how beautiful the trees, scenery will be forgotten—as they recall the littered spectacle of some highway.

The nation has awakened to the apalling problem of the litterbug. More than 40 states have passed antilitter laws. Americans are being fined every day, and yet we can look around us and see how little is being achieved.

The only way to handle the situation would seem to be to tackle the problem at the bottom and inform the riding public how just little bits of paper add up to the mountains of unsightly litter and public expense. The Highway Department, through its Information and Statistics Division, sends out radio and TV spot announcements calling attention to the hazards created by litter, and requesting the motoring public to keep the highways clean.

There is, of course, another way to make Texas litter conscious, and that is to have a few test cases of Section 2-696A of the state penal code. This law provides, upon conviction, a fine of not less than $10, nor more than $200, for littering a public highway. Making examples of a few roadside clutterbugs might bring it home to the people.

Those beer cans, tossed onto the right of way, hamper mowing activities, and candy wrappers and lunch sacks—aside from looking unsightly—can be the cause of accidents when let out a car window to blow against the windshield of another car.

Other states have taken stern measures to insure the beauty of their highways. In Virginia a litterbug may be fined up to $500. In Georgia the State Legislature has provided penalties up to a $1,000 fine and six months in jail for those who throw rubbish from automobiles. Many states assess first offenders only $1, but the trouble with this is that unless a record is made of his motor vehicle license, the first offender could strew trash all the way from Broadway to the Golden Gate and still remain that "first offender" in every community across the United States.

California and Oregon have drivers fearful of throwing even an unlit cigarette butt out of the window. California includes in its test for a driver's license a question about penalties prescribed by the state's antilitter law. (A $50 fine for a first offense, $100 or ten days in jail for a second. Third offense becomes a misdemeanor and has more severe penalties.)

Perhaps the method that best gets through to the individuals is that being practiced in Maryland. Magistrates there are now giving trash tossers 24 hours to clean up not only their own mess, but all other debris in the area where they have been found guilty of dumping.

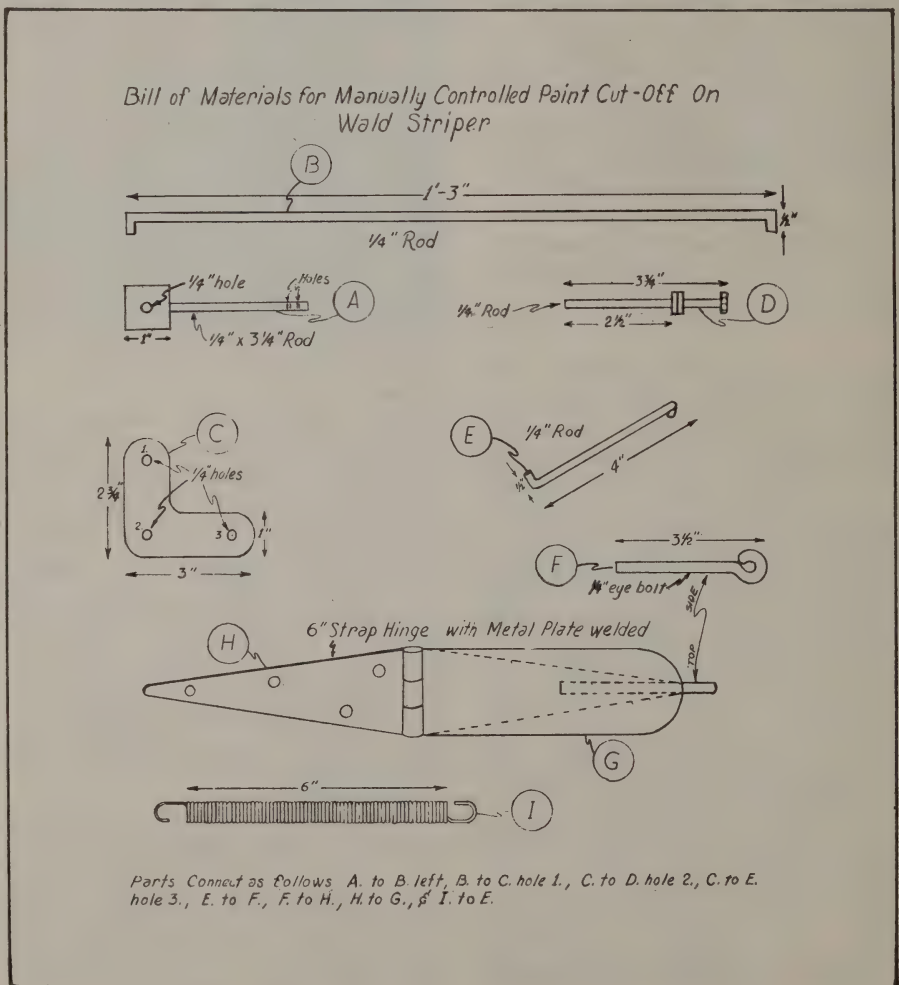
Delaware, New Jersey, and other eastern states are increasing their maximum fines, and in Massachusetts, a motorist convicted of tossing trash may have his driver's license suspended for 30 days. Indiana practices the gentle approach. Indiana has fines up to $100, but when an offender is caught in the act, his license is jotted down, sent to the state highway department, and, after checking car ownership, that agency sends a polite but firm note to the owner informing him of the violation and the penalty he could get.

There are public trash receptacles in all of Texas' roadside parks, and if every individual would use them, the byways and highways of Texas would never have cause to be named trashways.

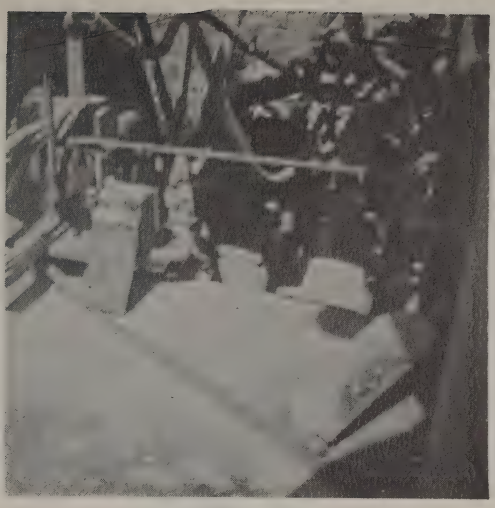
Truck-mounted Striper

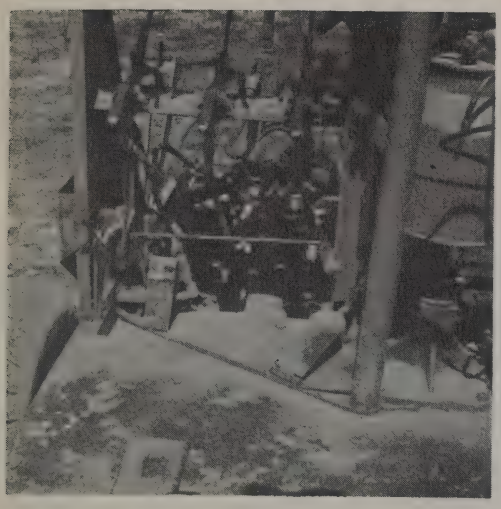
F. M. Davis, District Engineer
District 15

When District 15 started restriping white center stripe, some difficulty was encountered with the automatic device which controlled the application of the white dash stripe. Bob Mair, striping crew foreman, and his men tried everything they could think of to adjust the device to hit the old stripe with reasonable accuracy. This they could not do. Finally, Mair designed



Parts Connect as Follows A. to B. left, B. to C. hole 1., C. to D. hole 2., C. to E. hole 3., E. to F., F. to H., H. to G., & I. to E.





With this manually operated foot pedal, the paint gun hits the old stripe with much more accuracy.

a simple mechanical device to apply the stripe by controlling the paint gun with a foot pedal.

This device has been in use for several months and has proven very successful. Mair, or one of his assistants, turns the paint gun on and off with the foot pedal for each dash stripe and hits them very closely.

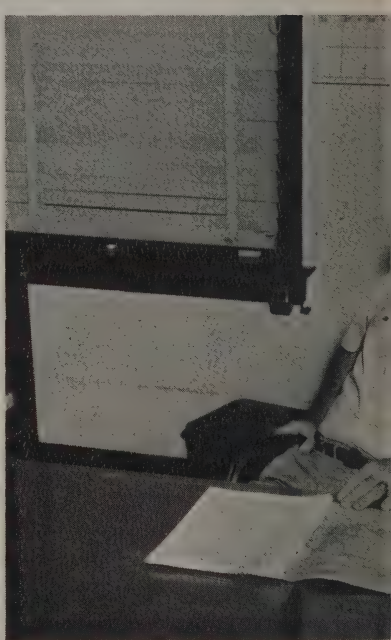
They have been asked if they don't get dizzy using the foot pedal all day, but Mair replied that they are watching the paint and beads go down all day anyway and that the foot pedal breaks the monotony for them.

The sketch shows the materials used and the snapshots show the machine using the mechanical control. The chain was removed from the sprocket to stop the function of the automatic control.

where the West

THE DISTRICTS PASS IN REVIEW

R. W. Barnes, Senior Right of Way Agent, and R. A. Bossy, District Engineer, discuss correspondence.



W. W. Potter, Assistant Distr
plans. He is also District Repo

begins...

Junior Office Assistants Lavelle Leonard and Joyce Rawdon check 102's.

ISTRICT 2

Engineer, looks over a set of
r for TEXAS HIGHWAYS.

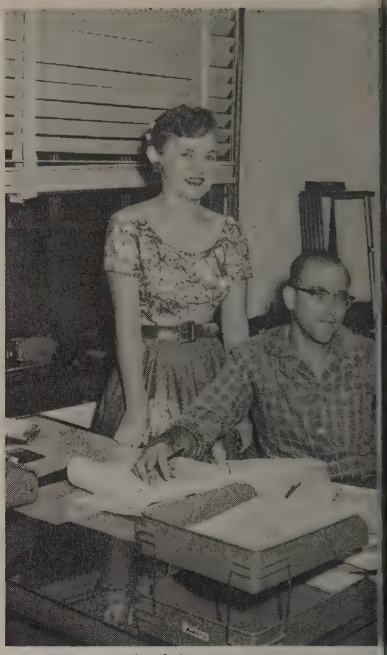
All Texans know where the West begins—and some people outside the state can tell you. It starts right at the city limits of Fort Worth, and everything from there on is WEST.

Fort Worth grew up around Camp Worth, military post established in 1849 as a deterrent to the Indians, and has grown into a city famous for its steaks, stockyards, Fat Stock Show, and aircraft industry.

It also serves as District Headquarters for District 2 of the Highway Department. Where today 493 employees carry out the work of the Department in this area, 100 years ago raiding Indians were discouraging half that number of settlers in the nine-county area. In 1866, the first of the great cattle herds was driven into this area from southwest Texas to the railheads in Kansas, and by 1870 it was a well-established trading and stopping post.

By 1890 the first stockyards had been organized in Fort Worth, and today the packing industry is still an important one to Fort Worth's economy. Industry and ranching are the biggest commercial enterprises of the nine-county District, with most of the 1,750 miles of roads leading to the metropolitan hub, familiarly known as Cowtown.

Freeway alignment comes under discussion by Rena Reynolds, Junior Draftsman; Donald Davis, Senior Engineering Assistant; Jay Taylor, Senior Engineering Assistant; Don Clayton, Junior Engineering Assistant; George Jefferson, Senior Designing Engineer; and C. R. Boyett, Senior Engineering Assistant.



Betty Skalsky, Junior Clerk; Accountant; Zelma Voreis, J. R. Stone, Senior Traffic signal charges.

Southwest Loop plans get a review from Melvin D. Gault and Frank J. Durda III, Engineering Assistants; James L. Lawrence, Designing Engineer; and James P. Montgomery, Junior Draftsman.

Checking an inventory of Scott, Accountant; Ernestine District Bookkeeper; and

Lee Reese Jr., Chief District Senior Office Assistant; and Engineer; talk over traffic

Sara E. Willis, Secretary, and Pauline M. Gidley, Senior Office Assistant, go over material for a stencil for right of way survey.

varehouse stock are Mildred
Abell; Typist, Bill Pollard,
onnie Sparks, Secretary.

Checking P. S. & E. of a road in Pala Pinto County are Robert Denman, Junior Office Assistant; Calvin Biggs, Engineering Assistant; Joe Norwood, Junior Engineering Assistant; and Rodolfo F. Ochoa, Draftsman.

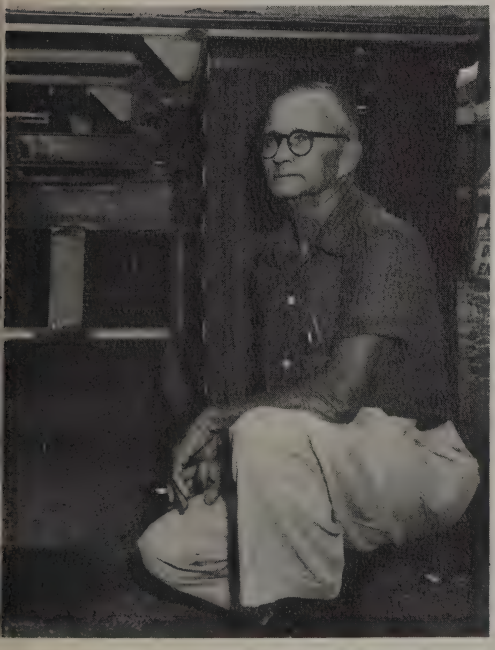
Administrative orders are surveyed by James W. Tobey, Senior Engineering Assistant; Barbara A. Tutor, Secretary; and Charles M. Farr, Former Resident Engineer.

T. Edward Nobles, Junior Office Assistant, and Joe W. Harris, Senior Office Assistant, discuss a permit.

James Cox, Senior Office Assistant, Cliff Harville, Senior Office Assistant; and Bill Chapman, Junior Office Assistant, give their attention to a proposed access driveway in Tarrant County.

A. M. Gordon, Expressway Engineer, and Robert W. Crook, Assistant Expressway Engineer, study prestressed concrete girder design.

Discussing plans on the proposed reconstruction of U. S. 180 are J. O. Painter, Associate Designing Engineer; J. G. Hamm, Senior Designing Engineer; and W. W. Potter, Assistant District Engineer.



J. H. Dilleshaw, Senior Equipment Supervisor, inspects the combination trailer and spreader box hitch designed by him.

Requisitions get the attention of Audrey Waddell, District Office Clerk and Lucille Smith, Accountant.

Our Highest Ranking Reservist

Brigadier General George P. Munson Jr.

Hundreds of Highway Department employees serve in numerous reserve units of the armed forces--some holding commissions, and some as enlisted men, but all doing a necessary job in America today.

One such man is commander of the 406th Engineer Brigade. He is recently promoted Brigadier General George P. Munson Jr., in civilian life Assistant District Engineer for the Department at Houston, and highest ranking reservist with the Department.

General Munson's 406th is an organization composed of units from various parts of Texas. Besides the Brigade Headquarters at Houston it includes two Engineer Groups, with two Engineer Battalions assigned to each Group, and four separate Engineer Companies.

Munson commanded the 843rd Engineer Aviation Battalion for two and a half years in World War II, with service in England, Normandy Invasion, France, and Germany. Missions consisted of construction of concrete airfields for the Eighth Air Force in England and construction of advanced airfields for IX Engineer Command in the invasion of Europe. He also commanded the 44th Engineer Group at Fort Leonard Wood, Missouri, and the 20th Engineer Brigade in France during the Korean War period. His mission in France consisted of construction of depots, roads, housing and other communications zone facilities.

Six and a half years of General Munson's 28 years of commissioned Army service have been on active duty. His decorations include the Bronze Star, four Battle Stars from the European Theater, and the French Croix d'Guerre, all awarded for action in World War II.

U.S. Veterans

Personnel Division has completed a survey of the Districts and Divisions to determine the number of veterans employed by the Texas Highway Department since State Law requires that 40 per cent of our personnel shall be composed of honorably discharged veterans of the United States Armed Forces, their widows and orphans.

As of September 30, 1956, the Department had 12,312 employees. Of this number, 5,479 are veterans of the United States Armed Forces, which gives us 44.5 per cent veteran personnel.

John Loudon McAdam

John A. Focht, Professor of Highway Engineering
The University of Texas

We are celebrating the 200th anniversary of John Loudon McAdam this year, a man whose name has been memorialized in connection with road building more than any other individual—traffic-bound macadam, water-bound macadam, bituminous macadam, and cement-bound macadam. He wrote several books, one of which is "Remarks on the Present System of Roadbuilding" from which a great deal of this paper is taken.

McAdam was born in Scotland in 1756, and did most of his road work in England, but he lived in the United States for thirteen years in the early part of his life. He married a Miss Nicoll of Long Island—"A lady of great beauty and merit, with a large fortune." He lost heavily during the Revolutionary War, but when he returned to Scotland in 1783, he carried with him a small fortune.

McAdam soon became a good-roads enthusiast, and spent a number of years of his life, and part of his personal fortune, traveling and observing road-construction methods. Finally in 1816, when he was 60 years old, he persuaded the authorities to turn over to him the 146 miles of road around Bristol, and he tried out his pet theories of road building. In a comparatively short time the improvement of the roads was so noticeable that other road builders all over England were coming to him for advice and assistance.

All of the main roads in England were toll roads. For ease of operation these roads were divided into

John A. Focht

independent short sections varying from just a few miles to about 30 miles in length—called trusts. In 1838, there were 1,116 trusts with 7,796 toll gates controlling 22,000 miles of roads and collecting an annual revenue of 1,458,000 pounds.

The first Turnpike Act designed to force the user to pay for the upkeep of the road was passed during the reign of Charles II, but it was not until 1767 that it was made operative and extended to every part of the kingdom. Toll houses and gates were built at every turn in the road, and large revenues were collected from the public. Mismanagement was common, and when debts would accrue, the trustees of the trust would go to Parliament and ask for permission to raise the tolls. In spite of universal protests, tolls were doubled between the years of 1805 and 1818.

McAdam was very critical of a number of practices prevailing at the time, and he never ceased crusading for the correction of what he thought was wrong. Permission to establish a trust was an Act of Parliament, and permission to increase tolls was another Act of Parliament. McAdam was very critical of the system whereby a group representing the trust should have to go to London, employ lobbyists, and stay month after month in order to get its petition presented to Parliament, and favorable action taken. "There is no object which appears more deserving of regulation than the expense attending the passing and renewing of Turnpike Acts." He felt this money should go into the construction of better roads, and if a surplus developed, the tolls could be reduced. He was experiencing two of our modern problems—expense of lobbying, and diversion of funds.

He charged that the construction and maintenance were performed under the supervision of men who were totally unprepared for this responsibility; many of these supervisors were appointed on account of political connections rather than experience or ability. "Thus, while many simple trades require by law an apprenticeship of seven years before the person is thought qualified to practice with his own capital, the road surveyor is supposed fit the very hour he is named for an office which requires at least as much understanding and experience as the average of the trades, and in which he has the capital of the parish to speculate with." An excerpt from one of his reports regarding the character of supervision is: "One of these surveyors was an infirm old man, another a carpenter, and another a coal merchant. I found on the Trades Mill trust three surveyors also and the trust divided into three districts. One was a very old man, another a publican, and the third a baker, with a salary of fourteen shillings a week each. At Huntingdon the surveyor was a bedridden old man who had not been out of the house for months and who had been allowed by the Commissioners to apply to a carpenter for assistance to whom the Commissioners paid a salary of 20 pounds per year. This person who accompanied me on every visit of inspection stated that he could give little attention to the management of the road the salary being so small; and the state of the roads bore evidence of the truth of his assertion."

McAdam reported, "The practice common in England and universal in Scotland on the formation of a new road is to dig a trench below the surface of the ground adjoining, and in this trench deposit a quantity of large stones; after this a second quantity of stones broken smaller, generally to about seven or eight pounds weight. The careless way in which this device is generally performed leaves the road as a sieve to receive water. It penetrates through the whole mass and is retained in the trench whence

the road is liable to give way in all changes of weather. It must, therefore, be obvious that nothing can be more erroneous than to provide a reservoir for water under the road where it is acted upon by frost to its destruction.

"The materials of which the present roads are composed are not worn out, but displaced by the action of the wheels of the carriages upon the stones of too large size; the wheel does not pass over the materials of which the road is formed, but is constantly encountering an obstacle which must either give way and be removed, or the carriage must be lifted by the force of the cattle so as to surmount it, in either case, the road is injured, and the carriage impeded, and the injury and impediment will be in direct proportion to the number and size of obstacles."

McAdam was a very careful observer, and after years of travel he developed his theories of drainage of the road bed, making the surface of the pavement waterproof, and using broken stone of small size in the pavement.

McAdam insisted: "The first operation in making a road should be the reverse of digging a trench. The road should not be sunk below, but rather raised above the ordinary level of the ground; care, at any rate, should be taken that there be a sufficient fall to take care of the water, so that it should always be some inches below the level of the ground upon which the road is intended to be placed; this must be done by either making drains to lower the ground, or if that be not practicable from the nature of the country, then the soil upon which the road is proposed to be laid must be raised by addition so as to be some inches above the level of the water.

"Having secured the soil from underwater, the roadmaker is next to secure it from rainwater, by a solid road made of clean, dry stone or flint, so selected, prepared and laid as to be perfectly impervious to water."

These principles are recognized today as the first fundamentals of road building, but from the numerous failures we observe it is rather evident that many of the modern road builders do not comply with this law of nature.

McAdam arrived at the maximum size or weight of stone to be used in the surface in the following manner: "The size of the stone must be in due proportion to the space occupied by a wheel of ordinary dimensions on a smooth, level surface; this point of contact will be found to be longitudinally about an inch, and every piece of stone put into a road which exceeds an inch in any of its dimensions is mischievous." McAdam insisted that the layer of stone be uniform in size throughout for two reasons: "It is well known to every skillful and observant roadmaker that if the strata of stone of various sizes be placed on the road, the largest stones will constantly work up by the shaking and pressure of traffic, and the only mode of keeping the stones of a road from motion is to use materials of uniform size from the bottom." Also, he insisted the stones of the wearing surface were being pounded between the large stones of the base and the wheels of the vehicle.

McAdam built his roads about ten inches thick; he said, "The thickness of such road is immaterial as to its strength and carrying weight; this object is already obtained by providing a dry surface, over which the road is to be placed as a covering or a roof to preserve it in that state." He reported on a section of road near Bristol, which was allowed to wear thin because it was contemplated to make changes in alignment. "At present it is not much above three inches thick in most places, and in none more than four; yet on removing the road it

was found that no water had penetrated, and the natural earth beneath the road was found to be perfectly dry." The big problem for the road builder today, 1956, is to keep the subgrade dry.

Unemployment was a problem in McAdam's time, as well as our 1930's. He proposed the unemployed be given jobs of breaking stone for use on the roads. "The nineteen parishes of the City (Bristol) are combined for the maintenance of the poor and it is concentrated in St. Peters Hospital. I told the Governor I was opening several quarries near Bristol and arranged with him that all men who applied for maintenance on the grounds they could not find work were to be sent to me. We offered all who came piece work, but seven-eighths of them ran away. Out of 35, who came on one particular day, only five remained, but the result is that for the last three years the City of Bristol has not paid any applicant a penny."

The load limit was a burning question during McAdam's time as in ours. The width of the tire also entered into the argument. "The author has never observed any great difference of effect on a well-made road by narrow or broad wheels; either of them will pass over a smooth, solid road without leaving any visible impression. It must be admitted, however, that the wear of roads is proportioned to the weight and velocity of carriages running upon a given breadth of the tire of the wheels, and therefore, it is of consequence that some regulations should be adopted. The weights will be best and most easily regulated by the number of horses or other cattle drawing the carriages; and this may be made by the tolls at present payable on the cattle being levied in a larger ratio as the number increases."

Many of the present highway engineers are prone to think that safety and landscaping are newcomers in highway engineering, but it is interesting to note the following comments: "In this section it may be worthwhile to notice the situation of the hedge and ditch or rill on each side of the road; a more common but, I think, more dangerous and worse way is to form the ditch close to the road, and to plant the quick upon a raised bank beyond it. The advantage of having the hedge next to the road consists in greater safety to the traveler particularly if a ditch of any considerable depth is necessary, and in the hedge being supported in its growth from the ground under the road, without drawing upon the farmers side of the ditch. In a length of road made eight or ten years ago over a marsh, partly bog, the ditches were obliged to be deep and wide and, therefore, dangerous, I, therefore, ordered some cuttings of willow to be stuck in the roadside ditch. In about two years they formed a blind to the ditch, and now are so thick and strong as to be a complete security from all danger."

Keenness of observation is one of the secrets of development. Many roadbuilders pass over projects and do not realize the developments that are taking place, but occasionally someone does have his eyes open and makes some deductions. McAdam included in his book comments by one of his contemporaries, which are: "I have found great advantage from filling up or as it is called, grouting the joints with limewater which finds its way between and under the stones, and forms the whole into a solid concreted mass. The purpose served by the lime might also be effectually answered by mixing a little of the borings or chippings of iron, or small scraps of iron hoops with the gravel used in filling the joints of the pavement. The water would very soon create an oxide of iron and form the gravel into a species of rock. I have seen a piece of rusty hoop taken from

under water to which gravel had so connected itself for four or five inches around the hoop as not to be separated without a small blow of the hammer."

It is interesting to observe how similar the problems of our day compare with those of McAdam's. Many of them have not changed. Also, it is very important to remember that McAdam's general theories of drainage and keeping the subgrade dry cannot be emphasized too much even today.

what's in a name?

To those who are familiar with the High Plains, this picture will offer no clue as to the identity of the town pictured far in the background. This scene could be almost anywhere in the area and any town could easily have been given the same name—Levelland. County seat of Hockley County, Levelland was surveyed and plotted in 1912 and was given the name of Hockley City. However, it was not until 1921 that the community began to develop and in 1922 residents renamed it Levelland which they deemed more fitting because of the topography of the region. In 1924 a building boom began and the town has continued to grow; it now has an estimated population of 11,100. Located almost exactly in the center of the county, on State Highway 116, Levelland is the hub of a large farming and oil-producing area.

Concrete Bucket for Front-end Loader

R. N. Jennings, District Maintenance Engineer
District 7

Hubert Fields, Senior Maintenance Foreman, and M. Hunsucker, Skilled Laborer, both in the Junction Maintenance Section, have devised a concrete bucket for use on a front-end loader that has materially reduced the cost of placing concrete in small structures.

Use of the bucket has eliminated the necessity of constructing runways for concrete carts. Concrete can be placed where desired with a minimum amount of shoveling. Provision of a longer boom permits the bucket to be used on structures that are difficult to reach with a short boom.

Accompanying photographs illustrate the bucket and its use. Note that the boom of the device is connected to the front-end loader by one pin.

What is Your Guess...

Tom H. Taylor, Superintendent
Information and Statistics Division

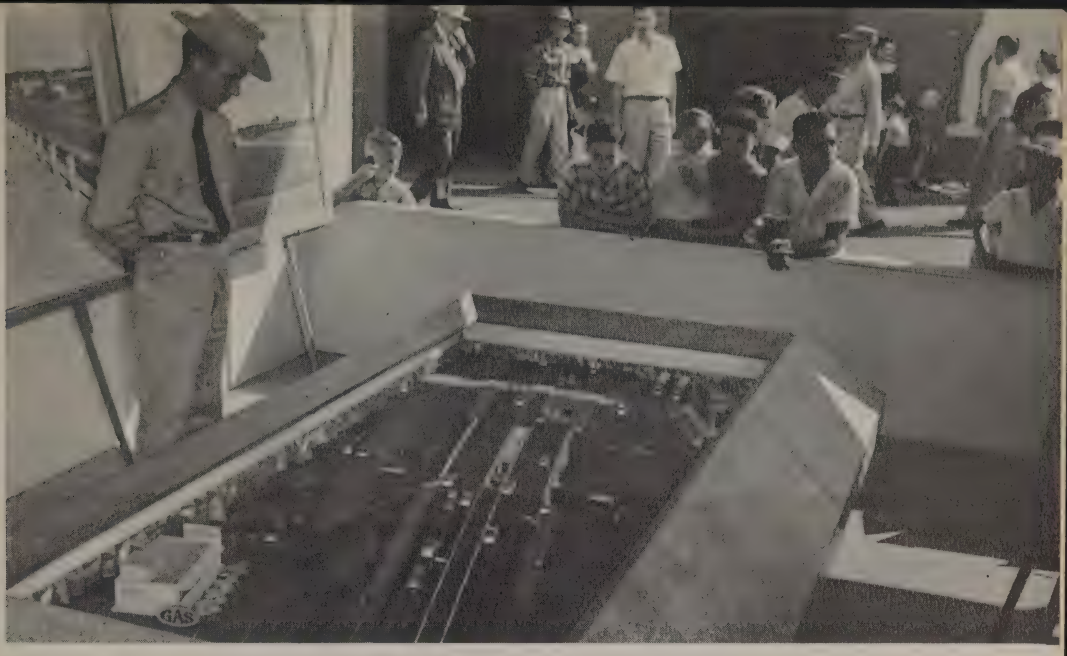
You're tired, thirsty, and your feet hurt. You're at the Fair, and just like the other million people who visit the State Fair of Texas—biggest event of its kind on earth. As you approach the Electric Building which divides the midway from the Exhibit Buildings, you notice a special combination information booth and exhibit building with a sign reading, "State Fair Information, Courtesy Texas Highway Department." As you get closer, you observe that attendants, in western uniform, are giving information literature to the Fair goers. In addition, they are answering questions from the curious crowd of people ganged about the Highway Exhibit.

As you elbow your way through the crowd, you see what's attracting all the attention. It is a model expressway with moving cars, just as you would see the real McCoy from the air. The strains of "Highways Are Happy Ways" can be heard over the noise of the crowd, and suddenly a voice booms forth welcoming you to the Texas Highway Department Exhibit. As you observe and listen, you see and learn of the many features found on the expressway-type highway, many you had never been conscious of before. Your attention is called to the frontage road which controls the access. The markings and entrance and exit ramps are explained along with other tips which you will want to remember.

Suddenly your attention is diverted when a small voice asks, "Daddy, what makes the cars move." "Electronics," was the authoritative answer.

As you continue to watch the animated model, an inquisitive child about eight years of age asks, "Papa, what makes the cars go." "Radar," came the expert reply.

You notice over your shoulder three ladies approaching the exhibit; however, one decided to stop in the



This uniformed attendant gave out information concerning the state, the Fair, and the Highway Department exhibit.

A model expressway with moving traffic, and pictures of modern expressways were on view in the Highway Department Information-Exhibit Booth.

Thousands of fair goers paused to observe the exhibit and receive literature about Texas and information about the Fair itself. Above is a front view of the building, and below is a side view.

shade of the building while the other two ventured over to the booth. Upon seeing the educational expressway model, "How cute," said one, "It's darling," replied the other. After observing the display and scrutinizing the crowd they rejoined their friend who asked what the exhibit was. "Oh, it's just some sort of thing where they're trying to teach you to drive..."

"Pop," comes a loud little voice, "bet you don't know what makes all those little cars move in all those different directions and speeds." "Simple, son, they use vacuum tubes." "No, Pop, that is not right. They use magnets. One is fastened on the car and another underneath on a chain to pull the car." "Ridiculous," intoned Papa. "What ever gave you an idea like that?" "The uniformed man in the booth," came the reply. "Nonsense, nothing like that would ever work."

Your feet are still aching, you're still tired and thirsty, you decide to move on. You feel that you have a better understanding of what an express highway is and the purposes of its many features. As you elbow your way away from the booth another thing sticks in your mind. You can't help but wonder "was the kid right, was it magnets or what..."

Personnel Changes

H. L. Arno, Director of Personnel

DISTRICT 2

District Headquarters, Fort Worth: Raymond W. Barnes changed from Chief District Accountant to Senior Right of Way Agent October 1, 1956.

District Headquarters Laboratory, Fort Worth: Justin M. Bingham changed from Laboratory Engineer to Senior Laboratory Engineer October 1, 1956.

DISTRICT 4

District Headquarters, Amarillo: Charles W. Smith changed from Assistant District Engineer to District Engineer October 15, 1956.

District Headquarters, Amarillo: James G. Lott, District Engineer, resigned October 31, 1956.

DISTRICT 6

County Residency, Kermit: Benjamin C. Sides, Senior Resident Engineer, resigned October 16, 1956.

County Residency, Monahans, to County Residency, Kermit: James R. Walker, Resident Engineer, transferred as Senior Resident Engineer October 1, 1956.

DISTRICT 10

County Residency, Mineola: LeRoy C. Carter, Senior Resident Engineer at Mineola, died September 17, 1956.

DISTRICT 11

District Headquarters, Lufkin: Henry H. Melton changed from Maintenance Superintendent to Senior Maintenance Superintendent October 1, 1956.

DISTRICT 20

County Residency, Silsbee: Hugh M. Hornsby, Jr., changed from Resident Engineer to Senior Resident Engineer October 1, 1956.

Expressway, Beaumont: Stirling W. Copp changed from Resident Engineer to Senior Resident Engineer October 1, 1956.

Expressway, Beaumont: Harrell J. Kelly changed from Resident Engineer to Senior Resident Engineer November 1, 1956.

DISTRICT 23

County Residency, Lampasas: John M. Arthur changed from Resident Engineer to Senior Resident Engineer October 1, 1956.

HOUSTON URBAN PROJECT, HOUSTON

Add Russell L. Miller as Senior Right of Way Agent September 1, 1956.

CONSTRUCTION DIVISION, AUSTIN

Wendell N. O'Neal changed from Administrative Aide to Senior Administrative Aide October 1, 1956.

Oliver A. Toombs changed from Field Engineer to Senior Field Engineer October 1, 1956.

MAINTENANCE OPERATIONS DIVISION, AUSTIN

Kenneth D. Collinsworth changed from Landscape Adviser to Senior Landscape Adviser September 1, 1956.

MOTOR VEHICLE DIVISION, AUSTIN

Sidney T. Grayson, Chief Investigator, resigned September 30, 1956.

ROAD DESIGN DIVISION, AUSTIN

To Right of Way Division, Austin: Archie H. Christian, Expressway Engineer, transferred as Right of Way Engineer October 1, 1956.

CAN'T SAY YOU WEREN'T WARNED . . .

This sign is five miles south of Kingsville on U. S. 77.

Thank you. . .

. . . I have just completed a vacation trip through the southwest and western states and I would like to take this opportunity to say my portion of the journey through your state was very pleasant, carrying picnicking equipment we found your roadside parks to be the best and more numerous than any we saw elsewhere.

Neat and clean, all of them showed your consideration for the traveling public and you may well be proud of them. I also took note of your road building, another pleasant experience. May I say thanks to your highway department and congratulations. . .

L. M. Risinger
Pine Lawn, Missouri

Another Texas "most" — trash. . .

. . . Having just ended a trip through Texas, Oklahoma, Kansas, Colorado, and New Mexico, I appreciate the smooth, wide, well-marked highways of our Lone Star State.

I regret to say that for housekeeping we are far behind other states (Colorado particularly). You can't find a can, a paper, or box rubbish dumped on Colorado highways. I saw only two beer cans on the 94-mile Turner Turnpike.

Just out of Roanoke, Texas, I saw one truck, five workers with sacks picking up cans and bottles on a first-class paved highway and from the littered conditions I am sure there was a truck load every mile. . .

R. C. Gage
Fort Worth, Texas

A letter to Roy C. Johnston, Maintenance Superintendent, Atlanta, Texas. . .

. . . When I suddenly realized that my automobile had broken down on the highway south of Atlanta, my first thought was concern that Mr. Harding and I would be stranded for several hours in the hot piney woods of East Texas.

We certainly did not need to worry any time at all because with your fine thoughtfulness and consideration for a fellow traveler, your car had already stopped and turned around and you were at our side offering assistance even before we had time to determine what had gone wrong.

Within a very short time, Mr. Carson came by equipped with a tow chain and got us into Atlanta with a total delay of only about 30 minutes.

Both Mr. Harding and I hope you will call on us for assistance any time you need it. We certainly hope to have the pleasure of reciprocating. . .

C. G. Hiskey
Houston, Texas

That gravel hazard. . .

. . . Recently the stretch of Highway -- between ---- and ---- was repaired. Since then it has become a hazard because when the trucks and cars pull over on the gravelled part on either side to let other cars pass, rocks are thrown into windshields. This week I have had five nicks and one bad crack made in my windshield on this road.

If you could talk to others traveling this road, I'm sure you would be convinced that this is not a "crank" letter but a serious matter which should be attended to soon. . .

(Signed)

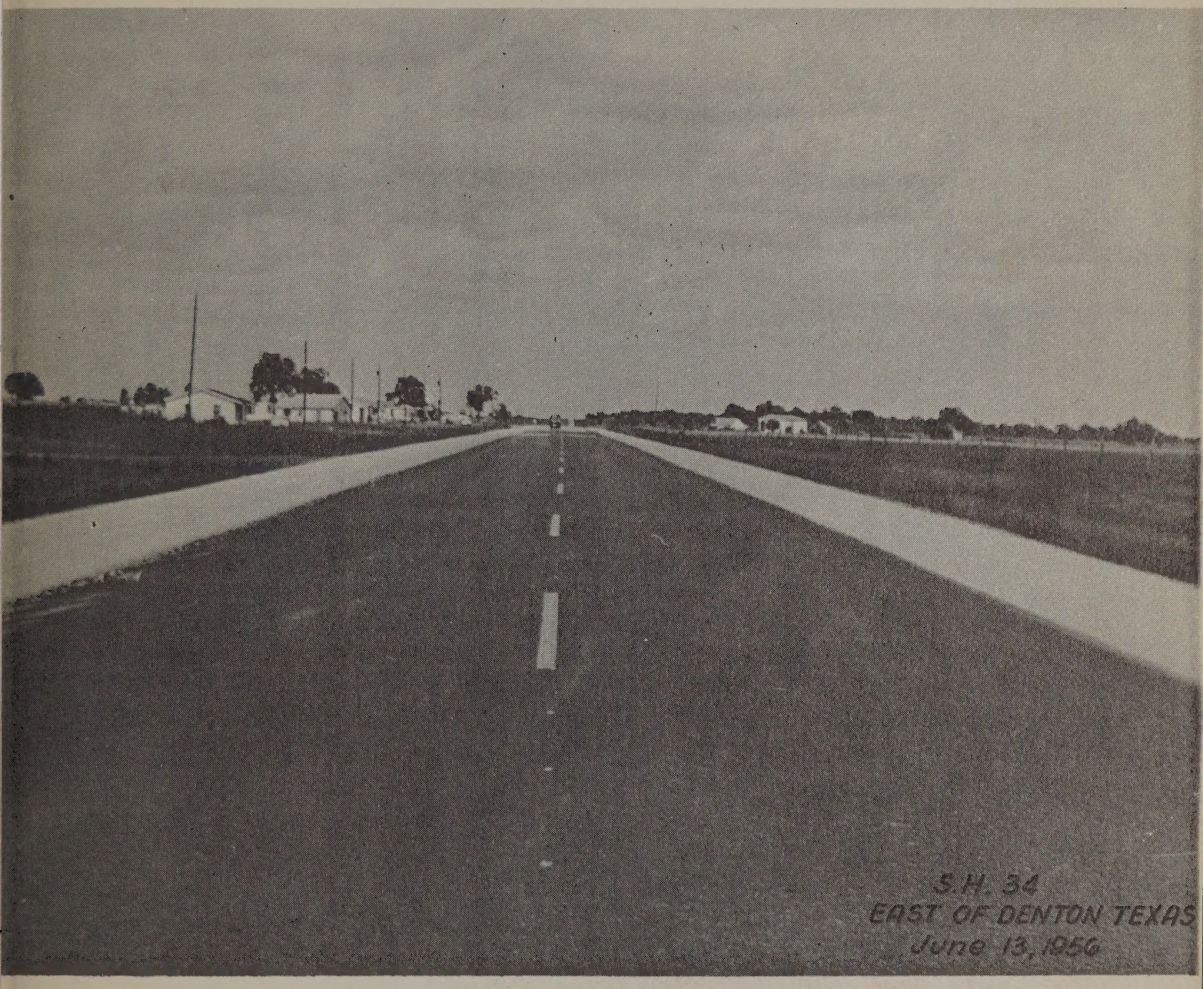
Letter to J.F. Snyder, District Engineer, Pharr, Texas

. . . I just wanted to write you a few lines to express our appreciation of the many times and ways in which you and many others in your Department have aided and assisted us of the Department of Public Safety.

We especially want to thank you, Mr. Haliburton, Mr. Bryant, and Mr. Moon for the many services that have been performed for us and the wonderful cooperation we have received.

If at any time, we can be of any assistance to you or your Department, we will be pleased to try to help you. . .

Glen Warner, Captain
Texas Highway Patrol
Harlingen, Texas



Administrative Order Number 9-56 set forth that a difference in color and texture should exist between pavement and shoulder surfaces. This example of results obtained when using a light-colored limestone for cover material on paved shoulders adjacent to an asphaltic concrete surface on the main roadway was sent in by Frank W. Cawthon, District Engineer of District 18.